

**ECONOMIST  
IMPACT**

# **Undetected and undertreated:**

**shaping policy on atrial fibrillation  
in Saudi Arabia**



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# About this report

*Undetected and undertreated: shaping policy on atrial fibrillation in Saudi Arabia* is an Economist Impact report, supported by Johnson and Johnson. The report explores the burden of atrial fibrillation (AF) in Saudi Arabia, particularly key barriers to care across current patient pathways and the local policy environment. The report also presents best practices in AF prevention, screening, diagnosis, treatment and management relevant to Saudi Arabia, and assesses how stakeholders in the Kingdom can work together to enhance awareness, prevention and control of AF.

The findings presented in this report draw on insights gathered from a pragmatic literature review, expert interviews and an advisory panel. We would like to thank the following individuals (listed alphabetically by first name) who served as our advisory panelists for providing key insights and guidance on the direction of our research:

- **Dr Abdulrahman Alqahtani**, executive vice-president of strategy and transformation, Health Holding Company, Saudi Arabia
- **Dr Adel Tash**, director general, National Heart Center; supervisor for cardiac services, Ministry of Health, Saudi Arabia
- **Dr Ahmad Hersi**, professor of cardiac sciences and consultant electrophysiologist, King Saud University
- **Dr Atif AlQubbany**, consultant, cardiology and interventional electrophysiology, adult congenital heart disease/electrophysiology, and complex ablation, King Faisal Cardiac Center, King Abdulaziz Medical City

- **Dr Heba Fouad**, regional surveillance officer, unit head, Noncommunicable Diseases Surveillance (NCS), WHO Regional Office for the Eastern Mediterranean
- **Dr Naeem AlShoabi**, president, Saudi Heart Rhythm Society; head of adult cardiology, King Abdullah University Hospital; consultant, cardiac electrophysiology, Jeddah
- **Omar Alhajjaj**, advisor, private and non profit sector participation, Health Sector Transformation Program, Saudi Arabia
- **Dr Riyadh Qainan Alghamdi**, deputy CEO, Public Health Authority

We would also like to thank the following individuals (listed alphabetically by first name) for contributing their insight and expertise on AF for this report:

- **Dr Ayman Al-Sulaimani**, chief medical officer and thoracic surgeon, International Medical Center, Saudi Arabia
- **Mellanie True Hills**, CEO and founder, StopAfib.org

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# Key takeaways

## A significant, and often silent, global health and economic burden

Among the diseases referred to as silent killers, atrial fibrillation (AF) is an increasingly important public health problem, with incidence expected to double over the next three decades. The global incidence of AF has increased by approximately 30% over the past 20 years, and more than 37m people are estimated to be living with AF, significantly impacting health, mortality risk and quality of life.<sup>1</sup>

Patients with AF are at higher risk for concurrent stroke, heart failure, hypertension and other cardiovascular diseases. Owing to its asymptomatic presentation in a significant proportion of patients, approximately 30%, many people with AF currently go undetected and therefore untreated, with potentially lethal consequences.<sup>2</sup>

The complex interplay between AF and other underlying and comorbid conditions makes the actual burden of AF difficult to untangle. For example, AF accounts for 25% of the global stroke burden.<sup>3</sup> Approximately 20% of patients who experience a stroke associated with AF are first diagnosed with AF at the time of the stroke.<sup>4</sup>

The prevalence of AF is increasing at a rapid rate in the Middle East, driven by economic development, an increasingly Westernised diet, and a higher incidence of metabolic and cardiovascular diseases.<sup>5</sup>

## The rising tide of AF in Saudi Arabia

Saudi Arabia is confronting an epidemic of chronic disease with alarming rates of obesity, hypertension and diabetes—all significant public health problems and risk factors for AF. This, combined with a rapid growth in the older population means that AF will continue to be a major disease in Saudi Arabia in the next 20 years. The high prevalence of chronic disease may explain the earlier onset of AF in the region. Increasing age as a risk factor for AF is especially critical for a country like Saudi Arabia, where the population aged over 65 is projected to increase by almost 600% over the next two decades, from over 1m in 2023 to 5.7m by 2040.<sup>6</sup>

The Saudi healthcare sector is undergoing extensive reforms in line with the country's Health Sector Transformation Programme, as part of Vision 2030, the country's national development plan.

Identifying the prevalence of non-communicable diseases in the country as a major public health concern, Vision 2030 explicitly targets the management of heart disease, stroke and diabetes.<sup>7</sup>

To effectively diagnose and manage AF cases in Saudi Arabia, there are numerous challenges that need to be overcome, including the availability and quality of health data, late detection and diagnosis, the absence of guidelines for screening and treatment, fragmented care pathways, and low awareness of AF and its consequences among non-cardiac specialists.



### Policy priorities for AF care in Saudi Arabia

The following key takeaways and proposed solutions are intended to guide successful policy implementation and long-term action on AF in Saudi Arabia, ultimately improving AF prevention, diagnosis and care, and enhancing quality of life for AF patients.

**Immediate priorities** include improving awareness of AF among primary care physicians and high-risk individuals, as well as implementing guidelines for AF referral.

**Short-term policy initiatives** should focus on integrating lifestyle interventions, education and effective management of AF and comorbid conditions into the current model of care. Leveraging developments in digital health infrastructure and electronic health records (EHRs) can improve data on the health and economic burden of AF, informing evidence-based decisions.

**In the longer term**, preparing for future healthcare challenges through investing in research and developing infrastructure and legislation to support emerging digital technologies will be vital.



#### Data and research

Maintain and expand AF **patient registries** and prioritise AF and cardiovascular diseases (CVDs) as part of the **national research agenda**



#### Primary and secondary prevention

Prevent the onset and progression of AF by way of **lifestyle intervention, education campaigns, early detection through increased clinical awareness** and **effective management of comorbid chronic conditions**



#### Early detection

Determine **appropriate guidelines for AF referral and screening** unique to the population demographics, health system capacity, and financing structure



#### Care pathways

Standardise care pathways through **adopting an integrated model of AF care with an established referral system and raising awareness of AF among diverse medical disciplines**



#### Digital

Prepare the healthsystem to **adopt emerging digital health technologies, leverage electronic health records (EHRs)** to support population screening and monitoring and **expand equitable access to AF care through telehealth**



#### Patient engagement

**Engage patients in treatment decisions** and empower them with the **tools to proactively manage their condition and ensure higher treatment adherence**

# Understanding the burden of atrial fibrillation

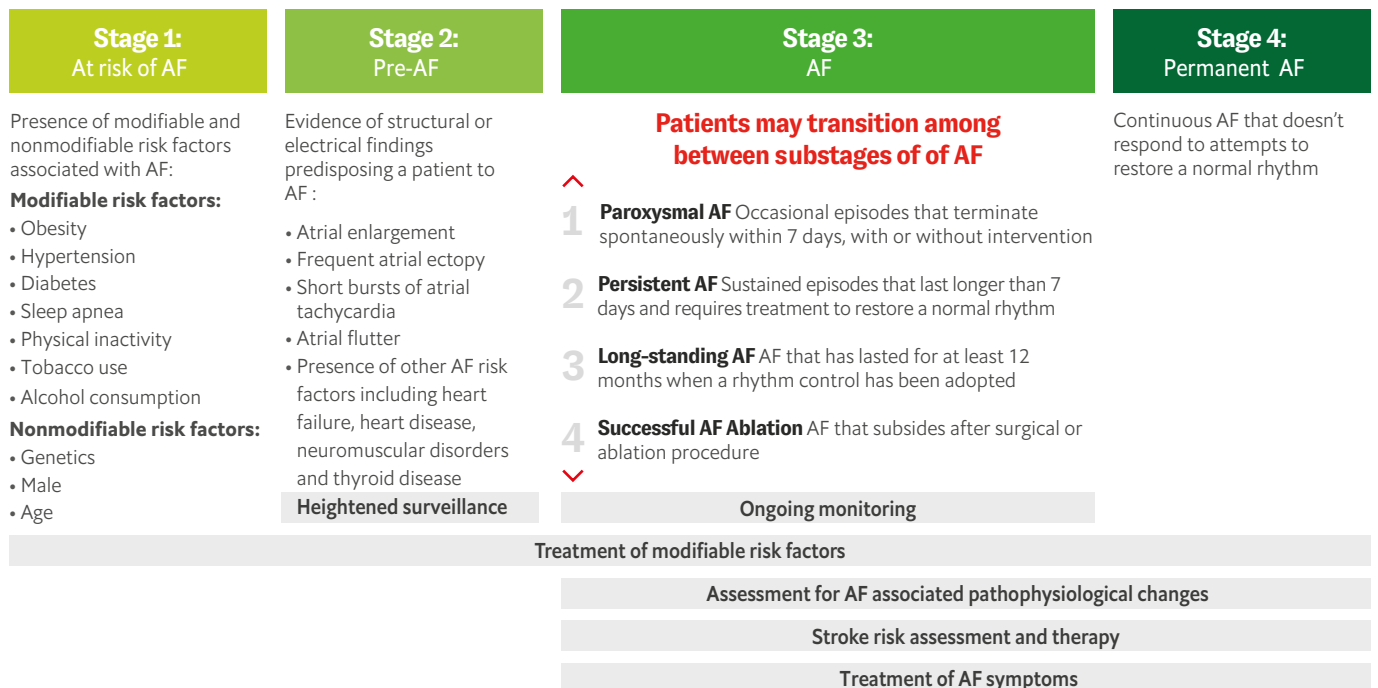
## A brief epidemiology

Atrial fibrillation is a common heart rhythm abnormality that involves irregular and often rapid heartbeats. It occurs when the atria, the upper chambers of the heart, beat irregularly (or fibrillate) rather than in a coordinated manner. This irregular rhythm can disrupt the flow of blood through the heart.<sup>8,9</sup>

Several factors increase the risk of developing AF, including age (particularly over 65), heart disease, hypertension, diabetes, obesity, smoking and sleep apnea.<sup>2</sup> Patients with AF are at higher risk for concurrent stroke, heart failure, hypertension and other cardiovascular diseases. Other less documented clinical consequences include cognitive alterations and depression.<sup>2</sup>

**Figure 1: Stages of atrial fibrillation**

AF is a progressive disease that requires a variety of management strategies at the different stages.



Source: Adapted from Joglar et al. 2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2024.

AF is a progressive disease that becomes more difficult to manage and treat over time. Owing to its asymptomatic presentation in a significant proportion of patients (approximately 30%), many people with AF currently go undetected and therefore untreated, with potentially lethal consequences.<sup>2</sup>

The standard management of AF generally has three components: controlling the heart rate, restoring normal heart rhythm in selected cases and reducing the risk of stroke.<sup>2</sup> Symptomatic arrhythmia can be managed by rate control to minimise symptoms (usually through pharmaceutical medication) or rhythm control (through electrical or pharmacological cardioversion or surgical or catheter ablation) to restore or maintain normal heart rhythm.<sup>4</sup> Most AF patients receive oral anticoagulation to decrease the risk of ischaemic stroke and other embolic events.

Lifestyle intervention is another important component of the AF treatment algorithm. Reducing modifiable risk factors such as obesity, diabetes, hypertension and tobacco use can relieve symptoms, slow progression and improve quality of life.<sup>10</sup> However the optimal treatment strategy is individual to each AF patient and should consider patient history, risk factor, arrhythmia type.<sup>11</sup>

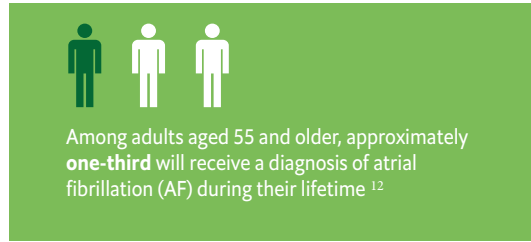
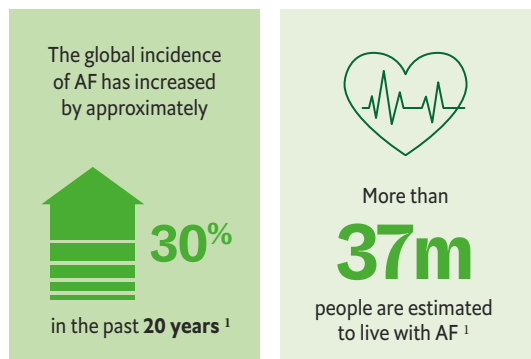
**A significant, and often silent, global health and economic burden**

AF has become an important public health problem in recent decades, significantly impacting health, mortality risk and quality of life, and demanding increasing healthcare resources.

The global incidence of AF has increased by approximately 30% in the past 20 years, and more than 37m people are estimated to live with AF.<sup>1</sup> Among adults aged 55 and older, approximately one-third will receive a diagnosis of AF during their lifetime.<sup>12</sup> The population aged over 55 in Saudi Arabia is projected to grow from 3.8m, 17% of the population, in 2023 to 12.4m, 41% of the population, by 2040.<sup>6</sup>

The chronic nature of AF, the need for lifetime clinical follow-up, and the volume of hospitalisations and long-term treatments present a significant economic burden for health systems and societies. The economic burden associated with AF was estimated at US \$31bn in the US in 2015 and, according to projections from the American Heart Association (AHA), is expected to increase to over US\$65bn by 2035.<sup>13</sup> Direct medical costs, which include hospitalisation, medication, long-term care and outpatient visits, accounted for almost 80% of the associated costs in 2015.

A US-based study found that patients with AF incurred an additional US\$27,896 in healthcare costs per year, compared to patients who did not have AF, with the majority of these costs stemming from inpatient and emergency care visits.<sup>14</sup> In the UK, AF is estimated to cost the National Health Service (NHS) between £1.43bn (US\$1.73bn) and £2.54bn (US \$3.18bn), or between 0.9% and 1.6% of annual NHS expenditure in 2020, mostly from hospital admissions. It is projected that the direct costs



**“AF is usually combined with other comorbidities. Trying to figure out how much of that cost is related to AF and how much [is linked to] other comorbidities requires further in-depth analysis.”**

Dr Ayman Al-Sulaimani, chief medical officer and thoracic surgeon, International Medical Center, Saudi Arabia

of AF could increase to over 4% of annual NHS expenditure in the next two decades.<sup>15</sup> While limited economic data is available on the costs of managing and treating AF in Saudi Arabia, workshop participants estimated that the costs were likely comparable to those of the US.

The complex interplay between AF and other underlying and comorbid conditions makes the actual burden of AF difficult to untangle. “AF is usually combined with other comorbidities,”

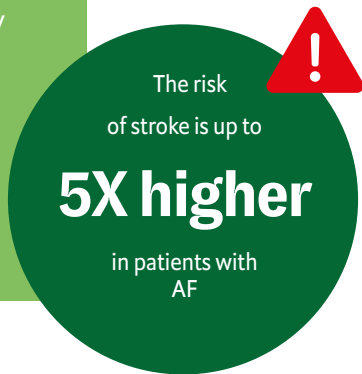
“says Ayman Al-Sulaimani, chief medical officer and thoracic surgeon at the International Medical Center. “So trying to figure out how much of that cost is related to AF and how much [is linked to] other comorbidities requires further in-depth analysis.” “Sometimes it’s very difficult to discern if AF was the primary reason for admission or was its heart failure or another comorbid condition,” adds Ahmad Hersi, professor of cardiac sciences and consultant electrophysiologist at King Saud University. “This makes it difficult to attribute the costs to AF.”

**A leading risk factor for stroke** 

The above economic data omits the additional costs associated with AF patients who develop stroke. AF accounts for 25% of the global stroke burden.<sup>3</sup> The risk of stroke is up to five times higher in patients with AF, and AF-related strokes are linked to more serious disability and a higher rate of mortality.<sup>16</sup> Approximately 20% of patients who experience a stroke associated with AF are first diagnosed with AF at the time of the stroke.<sup>4</sup> However, experts estimate that this figure is likely to be higher in Saudi Arabia. “Neurologists will tell you that more than 50% of our stroke patients have AF,” says Adel Tash, director general of the National Heart Center and supervisor for cardiac services in the Ministry of Health.

Stroke is the second highest cause of mortality in Saudi Arabia, and stroke related mortality is expected to double by 2030.<sup>17</sup> Stroke patients in Saudi Arabia are also younger, with a mean age for the first incidence of stroke at 63 years, compared to 70 in the UK and 69 in the US.<sup>17</sup> Stroke survivors are often left with severe and longstanding physical and mental disabilities, which contribute to the burden on health systems, family, community and the wider economy.

Stroke is the leading cause of death and disability globally, accounting for approximately 34% of total healthcare expenditure.<sup>18</sup> The Lancet estimates the treatment, rehabilitation, and indirect costs for stroke at over US\$700bn annually. One study estimates the average annual healthcare cost per stroke patient in the US at over US \$140,000. If current trends persist, the global cost of stroke is projected to surpass US \$1trn by 2030.<sup>19</sup> The World Stroke Organization Prevention Roadmap underscores the significance of preventing and managing AF, in addition to other clinical drivers like hypertension and diabetes, as crucial elements in stroke prevention.



The risk of stroke is up to **5X higher** in patients with AF



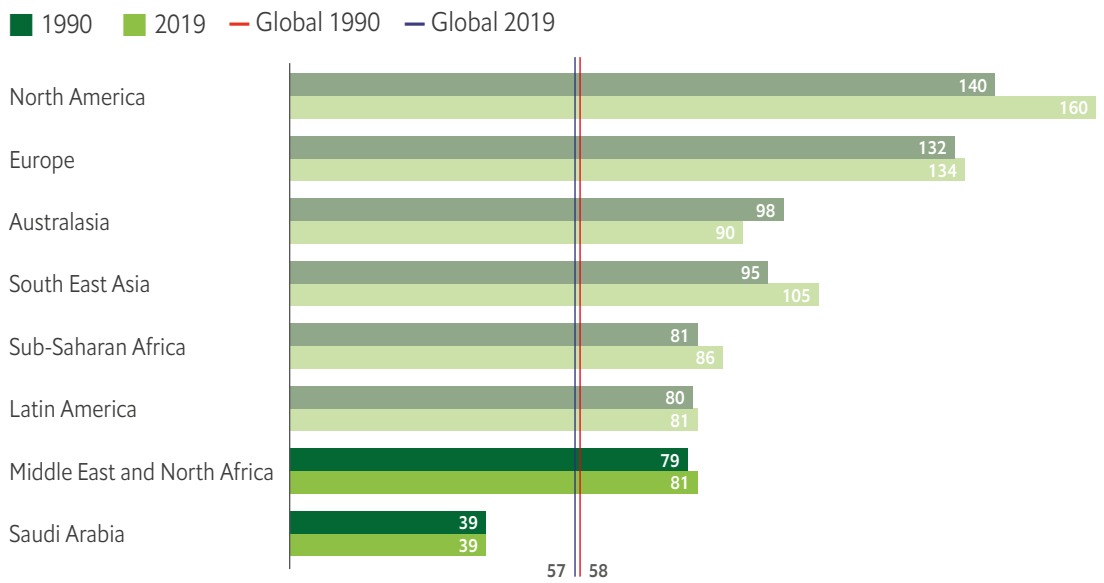


Over the next three decades, the incidence of AF is expected to double owing to demographic changes towards an ageing population, increased life expectancy and prevalence of risk factors for cardiovascular disease, longer survival rates of chronic diseases, and intensifying screening efforts.<sup>2</sup>

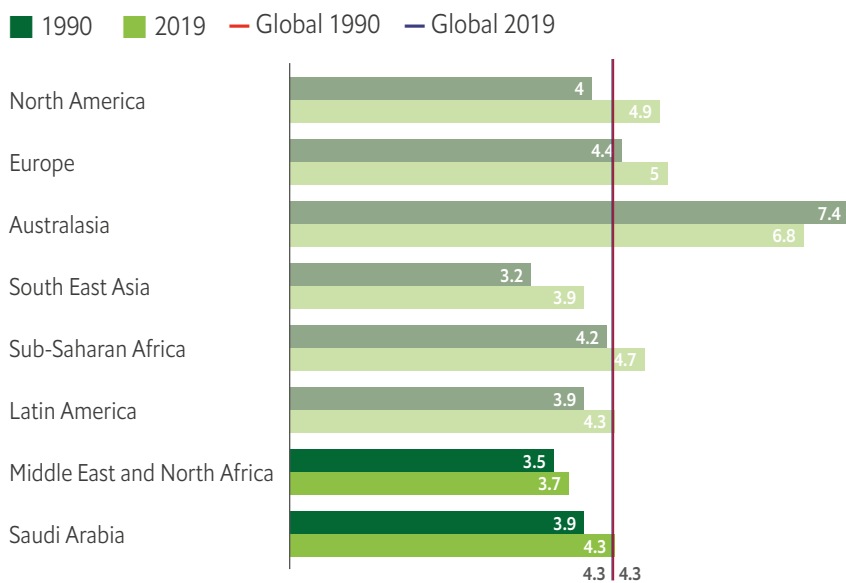
While the current incidence of AF is lower in the Middle East than global averages, it is increasing at a rapid rate, driven by economic development, increased consumption of a Westernised diet, and a higher incidence of metabolic and cardiovascular diseases. AF patients in the Middle East are also younger than in Western countries and have more comorbidities.<sup>5</sup>

**Figure 2: Global and regional burden of atrial fibrillation, 2019 (age standardised, both sexes)**

Incidence per 100,000 population (age standardised)



Mortality rate per 100,000 (age standardised)



Source: Jiao M, Liu C, Liu Y, et al. Estimates of the global, regional, and national burden of atrial fibrillation in older adults from 1990 to 2019. 2023.<sup>20</sup>  
 Note: Compared using age-standardised prevalence rates, which adjust estimated national health results to those that would exist if each country's population had identical age demographics.

### The rising tide of AF in Saudi Arabia

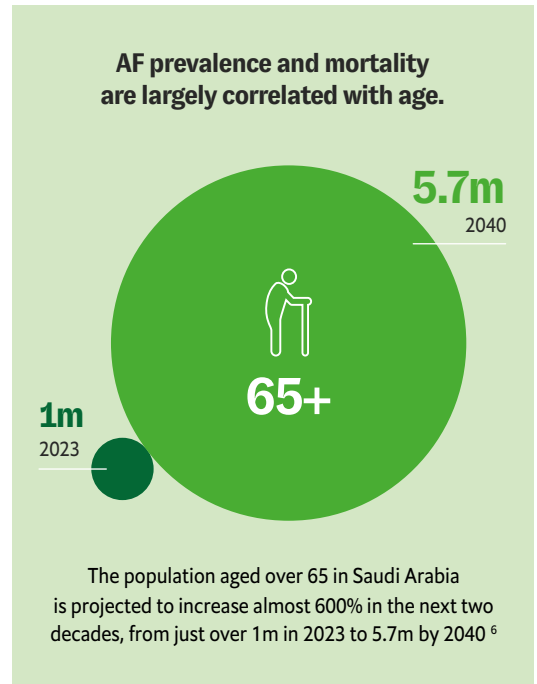
The incidence of AF in Saudi Arabia, at 39 per 100,000 population in 2019, is similar to that in other countries in the Middle East and North Africa and lower than the global average of 57 per 100,000 population. However, the AF mortality rate of 4.3 per 100,000 is higher than the regional average of 3.7 (figure 2).

Experts working with AF patients in Saudi suggest that these figures underestimate the burden. “We don’t have a clear prevalence of the disease, so we don’t know the full impact on Saudi society, although we see a lot of AF in our clinics and many of the patients are young and identified at the later stages,” says Dr Tash. “In any population, the number of AF patients will be underestimated because of the high number of asymptomatic patients,” adds Dr Hersi.

Saudi Arabia is confronting an epidemic of chronic disease with alarming rates of obesity, hypertension and diabetes—all significant public health problems and risk factors for AF (figure 3). 2023 data from the Ministry of Health’s Saudi Health Interview Survey reported that over half of the surveyed population had diabetes and hypertension, while 45% were obese.<sup>21</sup> The high prevalence of chronic disease may explain the earlier onset of AF in the region. “We have more risk factors than Europe—diabetes, high blood pressure, hypertension and obesity are all risk factors that we see more in younger patients,” explains Dr Tash. “It is important to intervene early because these patients will have [more progressive] AF [with more adverse outcomes] in the next 20-30 years.”

**“We have more risk factors than Europe—diabetes, high blood pressure, hypertension and obesity are all risk factors that we see more in younger patients.”**

Dr Adel Tash, director general, National Heart Center; supervisor for cardiac services, Ministry of Health



Globally, AF prevalence and mortality are largely correlated with age. Adults over 65 years of age account for over 73% of the global AF prevalence and over 90% of deaths related to AF.<sup>22</sup> The population aged over 65 in Saudi Arabia is projected to increase almost 600% in the next two decades, from just over 1m in 2023 to 5.7m by 2040.<sup>6</sup> An ageing population presents a risk factor for all chronic diseases, including AF, and increases the overall demand and use of healthcare services. A young population in Saudi today should translate to a decreased risk of AF. Yet, “what we see from the daily practice in our clinics is that the volume of AF in the community is huge,” says Dr Atif AlQubbany, a consultant in cardiology and interventional electrophysiology, ACHD/EP, and complex ablation at King Faisal Cardiac Center at the King Abdulaziz Medical City in Jeddah.

More broadly, in preparation for a projected population increase from 36.9m in 2023 to 44.8m in 2040, the healthcare sector is undergoing extensive reforms in line with the country’s Health Sector Transformation

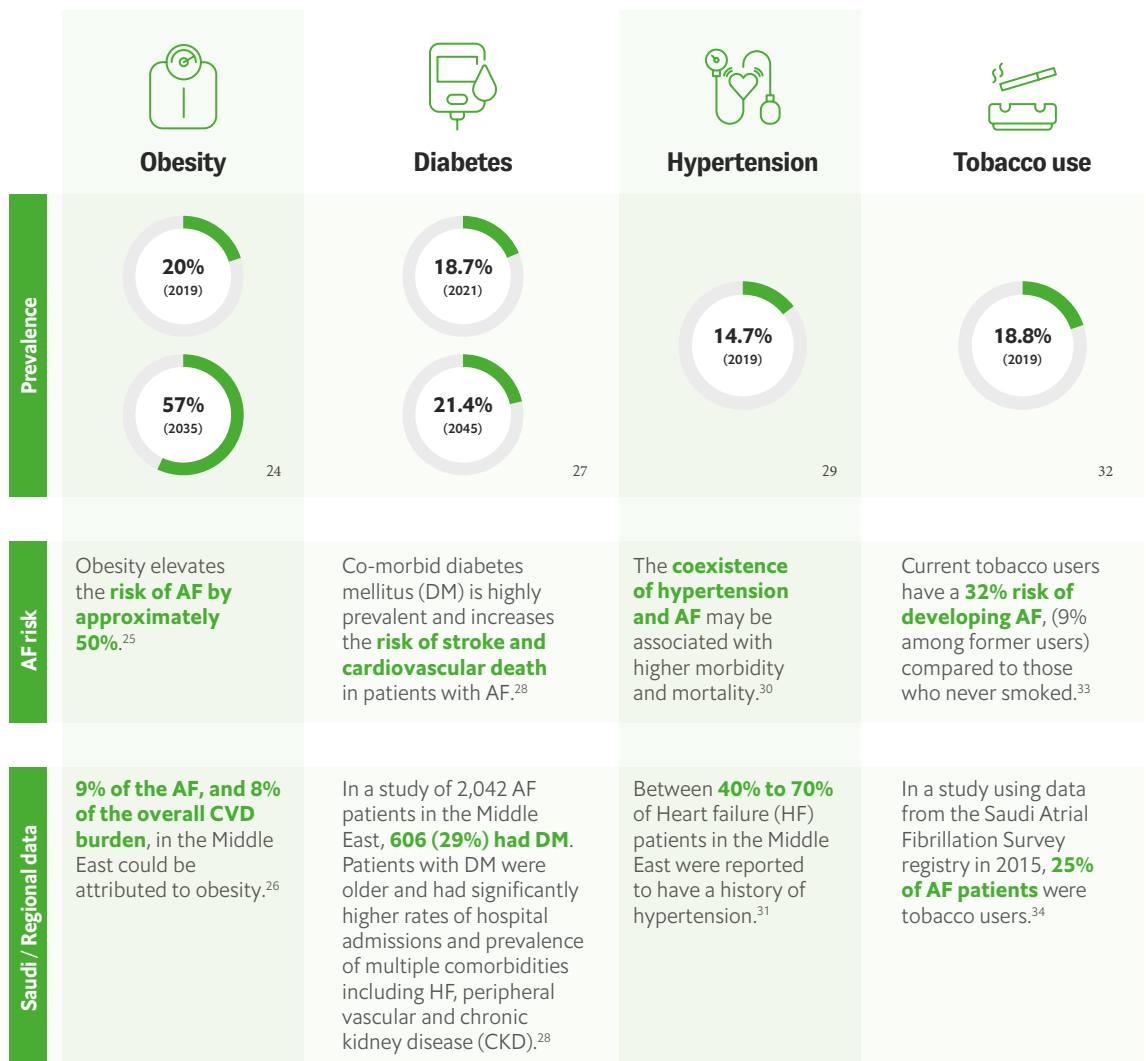
Programme, part of Vision 2030, a major national development plan.<sup>6</sup> Restructuring primary healthcare services to support prevention and effective management of chronic diseases is at the core of Saudi Arabia’s healthcare reforms.<sup>23</sup> “Saudi is a growing

community and we are going to have a lot of diseases,” says Dr Naeem AlShoaibi, president of the Saudi Heart Rhythm Society and head of adult cardiology at King Abdullah University Hospital. “Atrial fibrillation will be a major disease in the country in the next 20 years.”

## “Atrial fibrillation will be a major disease in the country in the next 20 years.”

Dr Naeem AlShoaibi, president, Saudi Heart Rhythm Society; head of adult cardiology, King Abdullah University Hospital; consultant, cardiac electrophysiology, Jeddah

Figure 3: Modifiable risk factors for atrial fibrillation in Saudi Arabia



# Current barriers to better atrial fibrillation care in Saudi Arabia

To effectively diagnose and manage AF cases in Saudi Arabia, there are numerous challenges that need to be overcome. These span across challenges with screening and data availability to care pathways and awareness levels among medical professionals. Below, we discuss the most pressing issues in more detail.

**The burden of AF in Saudi Arabia is underestimated.** The availability and quality of health data are significant obstacles to understanding the true burden of AF in Saudi Arabia and the interaction of underlying risk factors and comorbid conditions. Global estimates from the Institute of Health Metrics and Evaluation's Global Burden of Disease study are likely to underestimate the burden of AF in Saudi Arabia and the wider Middle East. "This is due to a lack of proper data and screening programmes to define the true prevalence of AF in our region," says Dr AlQubbany. "Available information is very outdated and collected from major cities like Riyadh and Jeddah, which doesn't represent

how AF is managed in the Kingdom." Furthermore, less than 1% of published research on AF comes from the Arab world, contributing to a limited understanding of the presentation and risk factors for AF among these populations.<sup>36</sup>

**Many AF patients are asymptomatic, which leads to late diagnosis and higher rates of morbidity and mortality.** One-third of the AF population is estimated to be asymptomatic; therefore, awareness and early detection are important.<sup>37</sup> A study using data from over 2,000 AF patients enrolled in the Gulf Survey of Atrial Fibrillation Events (Gulf SAFE), a survey of patients in six Middle Eastern Gulf countries, found that 26.5% (541) were identified as having asymptomatic AF.<sup>38</sup> Asymptomatic AF was associated with higher risks of stroke, systemic embolism, all-cause mortality and bleeding.<sup>38</sup> "One-third of AF patients are completely asymptomatic and the first presentation is with a stroke," says Dr AlQubbany. "Late detection increases the risk of adverse health outcomes, including stroke."

**The absence of screening and treatment guidelines for AF complicates the process.** Currently, there is no clear policy response or guidelines for the screening and management of AF in Saudi Arabia. "There is no clear pathway on how to screen for AF. Recommendations are based on European Society of Cardiology and the American



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Dr Atif AlQubbany, consultant cardiology and interventional electrophysiology, ACHD/EP and complex ablation at King Faisal Cardiac Center at the King Abdulaziz Medical City (KAMC) in Jeddah

Heart Association guidelines instead,” says Dr AlShoaibi. He adds that for screening to be cost-effective it needs to be targeted to the high-risk population. “In Europe and the US they generally screen everyone aged over 60, but we don’t know if this is enough [for Saudi Arabia]—we don’t have the data to show it.” AF screening could be bundled with a more established screening programme, such as the cardiovascular risk assessment, to balance population screening with the availability of resources and priorities of public health.

Although the Ministry of Health published clinical practice recommendations for treating patients with AF using anti-thrombotic medication in 2014, just over half of general practitioners (GPs) report adhering to these guidelines, according to a survey conducted in 2022 among GPs in the capital, Riyadh. Many surveyed GPs preferred to use international guidelines, while 44% of the GPs did not use guidelines in treatment decisions, citing the availability of too many guidelines as the main reason for non-adherence.<sup>39</sup> The absence of clear evidence-based treatment guidelines means that many AF patients in the region are suboptimally managed. Data from the Gulf SAFE registry show that just 14% of patients had received comprehensive treatment, compliant with the Atrial Fibrillation Better Care (ABC) pathway, an integrated approach to AF management based on three pillars: A, avoid stroke; B, better symptom control; and C, cardiovascular risk factors and comorbidities optimisation.<sup>29</sup>

**Fragmented care pathways for AF make it difficult for patients to get appropriate care in a timely manner.** The absence of screening and management guidelines contributes to a lack of standardisation of care and accountability among providers. “One of the main challenges is the lack of a clear pathway for our patients,” says Dr Abdulrahman Alqahtani, executive vice-president of transformation, Health Holding Company, a Saudi state-owned healthcare provider. “We need to make sure that patients have a clear pathway from wherever they are diagnosed or identified in any care setting to reach the right people and receive the right treatment at the right time. Accountability of providers is key here.” The complexity of the condition requires a multifaceted, holistic and multidisciplinary approach to the management of AF patients. Although specialised AF clinics that provide multi-specialty integrated care are available in larger cities, mainly Riyadh and Jeddah, “expansion of AF clinics is difficult due to special staffing and coordination requirements,” says Dr AlShoaibi.<sup>40</sup>

Heterogeneity in patient pathways and treatment coverage also exists between the public and private sectors. The public sector, operated by the Ministry of Health and accounting for over 60% of healthcare services, is adopting payment reforms based on the principles of value-based healthcare, shifting the focus towards life-long patient outcomes and quality of life.<sup>41</sup> The private sector, which provides care to expatriates, as well as Saudi nationals (and their dependents) working in the private sector, primarily operates a fee-for-service model with little accountability and incentive to address all components of an AF patient’s care.

**Awareness of AF and its symptoms is low among healthcare professionals and patients.** The lack of understanding of AF and its consequences is one of the most significant

**“One of the main challenges is the lack of a clear pathway for our patients.”**

Dr Abdulrahman Alqahtani, executive vice-president of transformation, Health Holding Company

challenges in diagnosing and treating the condition. The general public is often unaware of the signs and symptoms of AF, and even when diagnosed, patients frequently decline therapy or have poor adherence to treatment owing to inaccurate perceptions of risk. In a 2014 study of over 200 AF patients in Saudi Arabia, only 42% had basic knowledge of common AF symptoms, while 71% did not recognise that they were at high risk for stroke.<sup>42</sup> Among primary care physicians who are at the frontlines of identifying and referring high-risk patients, there remain significant gaps in the knowledge of AF, appropriate referral pathways and treatment options.

“We need to especially educate our primary healthcare physicians, many of whom don’t have enough knowledge to pick up symptoms and signs or perform an ECG on AF patients,” says Dr Tash. “Even some of our fellow general cardiologists would not refer an AF patient to a specialist.” Dr Tash attributes this to limited understanding of the gravity of the disease, the risk of stroke and the optimal treatment requirements. He adds that we also need to look at the “investor perspective ... We know prevention and treatment are important, but how do we communicate that AF is a disease that’s important to tackle?”

**“We know prevention and treatment are important, but how do we communicate that AF is a disease that’s important to tackle?”**

Dr Adel Tash, director general, National Heart Center; supervisor for cardiac services, Ministry of Health



# Key policy takeaways for improving atrial fibrillation care

The following key takeaways and proposed solutions are intended to guide successful policy implementation and long-term action on AF in Saudi Arabia, improving AF prevention, diagnosis and care, and enhancing the quality of life for AF patients.

## 1. Bridging the data gaps

Expanding research to better understand the risk factors, presentation and current challenges for AF in Saudi Arabia is fundamental to developing evidence-based screening and management guidelines and allocating resources effectively. “A good starting point is to have initiatives related to data collection, data aggregation, data analysis and knowledge formation that are then transformed from meaningful knowledge into actionable interventions,” says Dr Riyad Qainan Alghamdi, deputy CEO at the Public Health Authority.

There are numerous registries that can be used for this purpose. Regional and global patient AF registries, such as the atrial Fibrillation real

World management registry in the Middle East and Africa (FLOW-AF), Gulf SAFE, the Global Registry on LongTerm Oral Antithrombotic Treatment in Patients with Atrial Fibrillation (GLORIAAF), and the Saudi Atrial Fibrillation Survey registry, include patients from Saudi Arabia. These multicentric observational studies with large samples provide robust evidence of the disease prevalence, geographic variations, clinical outcomes, costs and the effectiveness of new treatment and management strategies.<sup>43,44</sup> Although useful sources of information, much of the available data on Saudi patients from these registries are over five years old and collected through specialist AF or cardiac centres that are not necessarily representative of the Saudi patient population.

“Owing to the lack of a national registry data in Saudi Arabia, monitoring AF programmes at a national level is difficult,” explains Dr AlShoabi. “The Saudi Health Council is currently working towards building sustainable healthcare registries with a focus on cardiovascular disease, which have the potential to shed light on several aspects of patient management in the country, including AF.” Sustainable sources of funding and human resources are needed to maintain existing registries and expand to wider population cohorts.

Furthermore, the recently formed Saudi National Institutes for Health promises to provide national oversight on research priorities



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Dr Riyad Qainan Alghamdi, deputy CEO, Public Health Authority

and to direct funding to where it can have the most health and economic impact.<sup>45</sup> Scaling up high-quality, evidence-based research to understand current clinical practices and factors unique to the Saudi population is critical to crafting national guidelines and locally targeted recommendations. Cardiovascular disease, an urgent public health concern in Saudi Arabia that accounts for over 45% of annual mortality, should be an immediate priority under the new research agenda.<sup>46</sup>

Dr Heba Fouad, regional surveillance officer and unit head, Noncommunicable Diseases Surveillance (NCS) at the WHO Regional Office for the Eastern Mediterranean also highlights the critical role of data and economic evaluations in the feedback loop for public health programmes and interventions, “Without such evaluations, it becomes challenging to determine the effectiveness, success, or utility of a programme.”

**“Secondary prevention and early detection is vital to prevent the progression from paroxysmal to persistent AF,”**

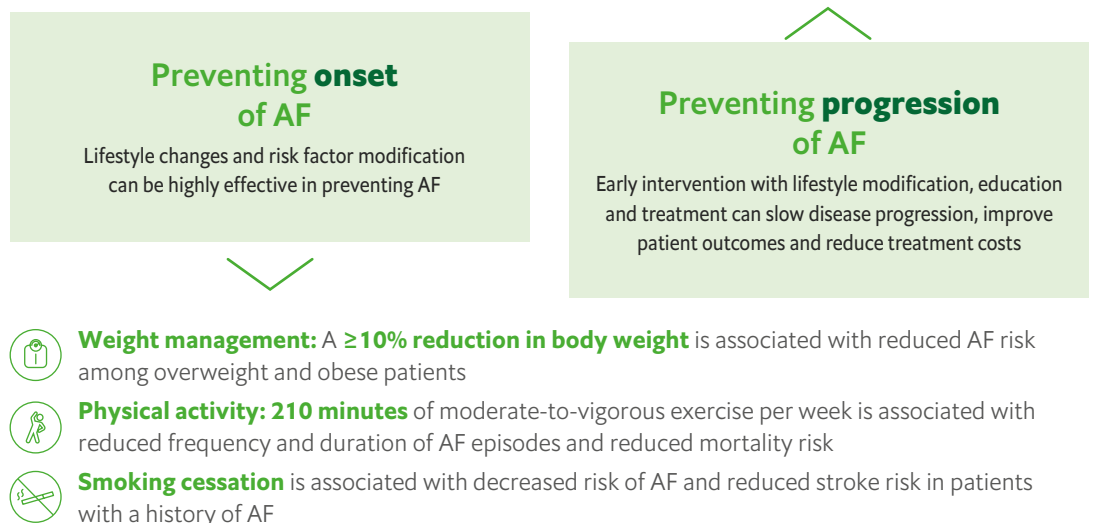
Dr Naeem AlShoaibi, president, Saudi Heart Rhythm Society; head of adult cardiology, King Abdullah University Hospital; consultant, cardiac electrophysiology, Jeddah

**2. Expanding primary and secondary prevention strategies**

AF prevention strategies include both primary and secondary prevention. Targeting modifiable risk factors and comorbidities, including sleep apnea, obesity, diabetes, hypertension, stress, exercise, diet and tobacco use can avert or limit AF progression.<sup>47</sup> Dr Fouad underscores the importance of addressing modifiable risk factors, “While atrial fibrillation may be the underlying cause of mortality or morbidity, we are often dealing with a complex interplay of various risk factors and comorbid conditions. AF is rarely attributed to a single factor.” The most frequent comorbidities associated with AF in Saudi Arabia are hypertension and diabetes, prevalent in 81% and 62% of AF patients, according to available studies.<sup>48</sup>

“Secondary prevention and early detection is vital to prevent the progression from paroxysmal to persistent AF,” says Dr AlShoaibi. In 2020, the AHA recommended risk-factor modification as an essential complementary pillar of AF management, alongside anticoagulation, rhythm control and rate control.<sup>49</sup> The AHA’s 2023 guidelines for diagnosing and managing AF underscore a more prescriptive focus on

**Figure 4: Lifestyle and risk factor modification for prevention and management of atrial fibrillation**



Source: Joglar et al. 2023 ACC/AHA/ACCP/HRS Guideline for the Diagnosis and Management of Atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation. 2024.



lifestyle modification for AF patients, including weight loss, physical activity, smoking cessation, alcohol moderation, blood-pressure control and screening for sleep apnea.<sup>50</sup>

Expanding the role and reach of primary healthcare centres (PHCs), the frontline of prevention and effective management of chronic diseases and efforts to reduce the cardiovascular disease burden, is at the core of Saudi Arabia’s healthcare reforms.<sup>45</sup> Proactive, structured and patient-centred approaches to address common risk factors and comorbidities for AF should be integrated into two elements of the new Saudi healthcare delivery model: the Keep Well system of care, which focuses on health promotion and population health, and Chronic Care, which focuses on screening, management and coordination of chronic diseases.<sup>51</sup> Although the country has an extensive infrastructure of primary care facilities, geographical distribution and staffing—including a high reliance on expatriate workers—are barriers to equitable access, especially in rural areas.<sup>52,53</sup>

### 3. Determine the parameters for AF screening




Timely detection of AF is crucial to safeguard patients from the consequences of arrhythmia and the progression of AF into fatal conditions.

AF screening can either be opportunistic (where a health professional checks for AF during a routine visit or consultation) or systematic (where all people in a particular age or risk group are invited for screening).<sup>54</sup>

Disagreement exists regarding the optimal approach for AF screening, as is evident in the recommendations of different international guidelines. Whereas some countries and associations have screening guidelines (see below), many international task forces, including the UK National Screening Committee and the US Preventative Services Taskforce, currently recommend against AF screening programmes, citing cost implications and uncertainty over the benefits of systematic screening compared to usual care.<sup>55,56</sup>

Opportunistic screening guided by age has not been shown to increase AF detection rates. Although the risk of AF increases with age, an approach based on age alone achieves low yields and overlooks the increasing number of people below the age of 65 with AF. Risk models that also consider individual characteristics, medical history or blood biomarkers play an important role in identifying people at sufficiently high risk for AF to warrant screening, improving early detection and diagnosis in these groups.<sup>55</sup>

Figure 5: Atrial fibrillation screening guidelines

 <b>ESC</b> European Society of Cardiology	<b>European Society of Cardiology (ESC)</b>	<b>Opportunistic screening: aged ≥65 years</b>	<ul style="list-style-type: none"> <li>• <b>Opportunistic:</b> pulse check or ECG rhythm strip</li> </ul>
		<b>Systematic screening: aged ≥75 years</b>	<ul style="list-style-type: none"> <li>• <b>Systematic:</b> ECG screening</li> </ul>
 <b>CSANZ</b>	<b>Heart Foundation and Cardiac Society of Australia and New Zealand (CSANZ)</b>	<b>Opportunistic screening: aged ≥65 years</b>	<ul style="list-style-type: none"> <li>• Pulse palpation followed by single-lead ECG rhythm</li> </ul>
 <b>Canadian Cardiovascular Society</b>	<b>Canadian Cardiovascular Society/Canadian Heart Rhythm Society</b>	<b>Opportunistic screening: aged ≥65 years</b>	<ul style="list-style-type: none"> <li>• Pulse check as primary method</li> </ul>

Sources: European Society of Cardiology<sup>2</sup>; Heart Foundation Atrial fibrillation clinical guidelines<sup>57</sup>; Canadian Journal of Cardiology.<sup>58</sup>

## “Screening has to be targeted at the high-risk population for it to be cost-effective; currently, there is no clear pathway on how to screen for AF.”

Dr Naeem AlShoaibi, president, Saudi Heart Rhythm Society; head of adult cardiology, King Abdullah University Hospital; consultant, cardiac electrophysiology, Jeddah

“Screening has to be targeted at the high-risk population for it to be cost-effective; currently, there is no clear pathway on how to screen for AF,” says Dr AlShoaibi. “[The Saudi Heart Rhythm Society] is working on a proposal for how to manage AF from the rhythm perspective to create our own local guidelines.” He hopes that this will help standardise care pathways and empower patients and physicians.

Policymakers in Saudi Arabia should consider the unique population demographics (some studies report earlier onset of AF in the Middle East), health system capacity and financing structure to determine how AF should be screened, diagnosed and managed.<sup>59</sup> “The capacity of healthcare should be taken into consideration; otherwise, you will diagnose a lot of people without proper treatment, and this can incur huge losses,” says Dr Alghamdi.

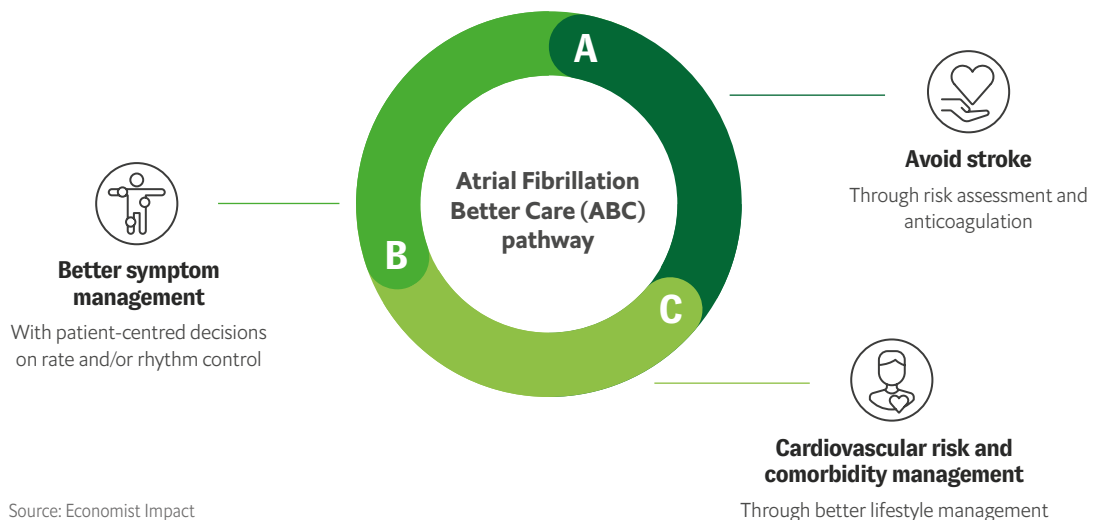
Given the development of the model of care and PHC infrastructure, integrating pulse checks into annual check-ups may be an appropriate starting point. In England, the introduction of pulse checks as part of regular health checks in the over-65 population was associated with a significant increase in the detection of AF.<sup>60</sup>

### 4. Standardising care pathways

Significant variations in care, underdiagnosis and inadequate treatment of AF patients are widely prevalent across all geographies, including Saudi Arabia, owing to a lack of standardised guidelines and established referral pathways.<sup>61</sup> An integrated approach to AF care has been associated with reduced hospitalisations and all-cause mortality.<sup>60</sup> Streamlining the care of patients with AF in daily clinical practice is a challenging but essential requirement for the effective management of the condition.<sup>5</sup>

Numerous guidelines suggest integrated, holistic management of AF patients through the formal introduction of the ABC pathway.<sup>63</sup> The ABC pathway provides a simple strategy of integrated approach of AF management:

Figure 6: Atrial Fibrillation Better Care (ABC) pathway



Source: Economist Impact



The ABC pathway underlines the need for proper and holistic symptom control of concomitant diseases and their associated symptoms. This means not only appropriate anticoagulation but also optimal management and control of other symptoms and comorbidities to yield reductions in all-cause mortality and adverse health outcomes.<sup>29</sup>

In an analysis of over 36,000 patients from the GLORIA-AF registry, which includes patients from Saudi Arabia, adherence to the ABC pathway was associated with a reduced risk of mortality and major adverse cardiovascular events. The study noted that adherence was higher in countries or health systems that already had a high level of integration within chronic disease care pathways.<sup>64</sup>

Effective implementation of screening and management guidelines for AF relies on an integrated healthcare system and the expertise and coordination of multiple healthcare disciplines, from primary care physicians, nurses, pharmacists, cardiologists and electrophysicists to neurologists, dieticians and physiotherapists.<sup>2</sup>

“The good news is that AF can initially be treated by internists, cardiologists [or] family physicians, who assess the patient and start them on anticoagulation,” says Dr AlShoaibi. “Then, if the patient has paroxysmal AF or requires further treatment, they can be referred to specialists and electrophysiologists.” He adds that an immediate priority area should focus on training primary healthcare providers to recognise the symptoms and risk factors of AF. This is important, as it will ensure efficient referral of patients to specialists. “The aim of primary care is to be the first line in detecting all kinds of clinical issues,” says Omar Alhadjaj, an advisor for the country’s Health Sector Transformation Program.

AF clinics or Centres of Excellence that bring together multidisciplinary teams to address all aspects of AF can improve health outcomes and the patient experience. However, ensuring equitable access to these clinics is of paramount

importance. Dr AlShoaibi recounts initial challenges when establishing an AF clinic in Jeddah, “We made the mistake of referring every patient [to the AF clinic] without accounting for the volume that would be received, which led to long delays.”

Nurse-led AF clinics can help alleviate the burden on the healthcare system by triaging patients who need care from a cardiologist or general practitioner (GP). Data from the US and Europe demonstrate reduced mortality and healthcare utilisation and improved patient outcomes and treatment adherence in nurse-led AF clinics compared to usual care.<sup>64,66</sup> According to Dr AlQubbany, nurses are at the heart of integrated care and have been integral to improving patient education and self-management in AF clinics in Saudi Arabia. However, the role of nurse practitioners in Saudi Arabia is limited, partly due to insufficient legislation.<sup>67</sup> “There is a need to upskill nurses and advance their mandate”, says Dr AlQubbany.

## 5. Preparing for the digital revolution

Advancements in digital health technologies, including electronic health records (EHRs), implantable device monitoring, wearable sensor data, analytics and artificial intelligence (AI), behavioural health, and personalised medicine, provide applications for the screening, diagnosis and management of AF.<sup>37</sup>

Two recent studies conducted by large technology multinationals show how smartwatches and mobile health devices with photoplethysmography (optical heart rate monitoring) and ECG technology can assist with AF screening.<sup>4</sup> In the Apple Heart Study, a smartwatch assessment of over 419,000 individuals in the US, 0.5% received an irregular pulse notification, with AF confirmed in 34% of monitored participants following ECG patch monitoring.<sup>2</sup> In the Huawei Heart study, a China-based study of over 187,000 individuals, 0.23% received a “suspected AF” notification

## “Patients felt like they had more control if they were able to better monitor and manage their AF using these digital health tools.”

Mellanie True Hills, CEO and founder, StopAfib.org

via smart wearables, with AF confirmed in 87% of these individuals.<sup>2</sup> These studies have amassed considerable attention, potentially offering more cost-effective solutions for AF screening in the future.

Available evidence suggests that digital technologies are more accurate than standard clinical practice using a pulse check or ECG for detecting undiagnosed AF.<sup>68</sup> However, as many of these devices are not yet clinically validated, caution is required in clinical practice. The US Preventive Services Task Force also warns that abnormal test results that lead to further testing and treatments and anxiety among individuals have the potential for harm. As such, more research is needed to understand the risks and benefits of expanding screening for AF using digital devices.<sup>4</sup>

Other barriers that may deter the use of wearables for AF screening include concerns over payment, as physicians anticipate receiving hundreds of patient-generated ECG readings from wearable technology, and accountability for the accuracy of the data.<sup>68</sup> “The future of screening with wearables also presents a challenge for accountability,” says Dr AlQubbany. “A person cannot sue Apple if they have atrial fibrillation and [an Apple smartwatch] fails to discover it.”

With the potential to make care more affordable and accessible, digital technology will inevitably become a centrepiece of AF diagnosis and management. Mellanie True Hills, CEO and founder of StopAfib.org, a patient advocacy organisation, says that AF patients are very receptive to technology—digital tools, devices or apps were being used by 71% of AF patients in a recent survey conducted by the organisation. “Patients felt like they had more control if they were able to better monitor and manage their AF using these digital health tools,” she says.

“Screening can be a costly exercise, but now, with technology, this cost is going down tremendously,” says Dr Tash. “Machines can do a lot of what we needed to do in the past in a more cost-effective, faster and, in many aspects, more accurate way.” Saudi Arabia has a young, tech-savvy population, with internet access and smartphone penetration among the highest globally, providing a good basis for digital health applications.<sup>69</sup> “We have a community that is aware,” says Dr AlShoabi. “We have wearables that can detect atrial fibrillation. We need to use them more now, especially for higher-risk patients.”

Beyond wearables, EHRs can also help to identify sub-populations for elevated AF risk and monitor treatment and outcomes.<sup>70</sup> Saudi Arabia has made progress in the development of its national EHRs as it seeks to improve access and equitable geographical distribution of health services. One Vision 2030 and Health System Transformation goal is to have 100% of the



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Dr Adel Tash, director general, National Heart Center; supervisor for cardiac services, Ministry of Health

population covered by a unified digital medical records system by 2025.<sup>7</sup> “One of the main pillars of healthcare transformation is the model of care and how we can transform the care pathway in this age of digital transformation,” says Dr AlQahtani.

EHRs have the potential to support prediction and risk stratification models to inform and support screening policy.<sup>71</sup> Engagement with EHR vendors and health information specialists in the expansion of Saudi’s EHR system can enable the integration of AF-related data that can be easily

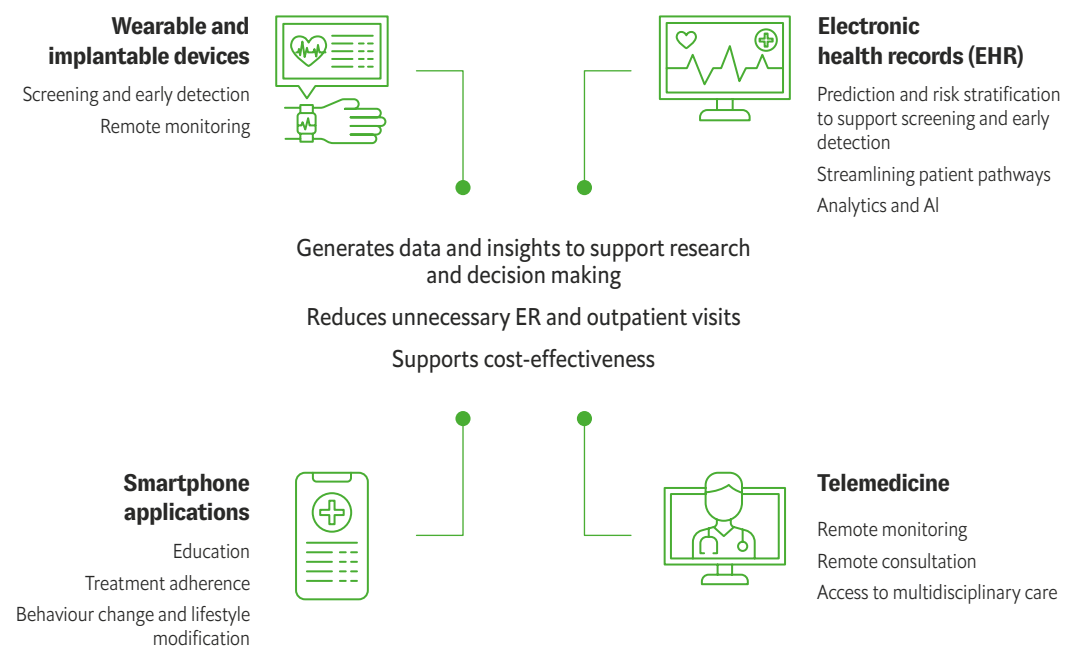
accessed and integrated with programmes for comorbid conditions, and ultimately support the streamlining of patient pathways.<sup>61</sup>

Telemedicine is also important to the future of health service delivery in the country and can support equitable access to AF clinics and support multidisciplinary AF care.<sup>72</sup> To this end, the Saudi Telehealth Network initiative is working to enhance the quality and cost-effectiveness of telecare, particularly in rural and remote areas. The country’s Cooperative Health Insurance Law also mandates the coverage of telemedicine services.<sup>73</sup>

### 6. Empowering and educating patients

Patient engagement, education and empowerment are critical success factors for any AF policy and intervention.<sup>74</sup> Patients with, or at high risk for, AF should be informed and

**Figure 7: Digital health solutions for atrial fibrillation detection and management**



Source: Economist Impact

involved in decision-making to understand the symptoms of the condition, the importance of adherence to treatment protocols and the tools available to proactively manage their condition.<sup>75</sup>

Enhancing patient-centric care is at the heart of the health-sector transformation agenda and the new model of care in Saudi Arabia.

“The model of care is based on the principles of patient empowerment: to make sure [patients] take care of their health, and [to] enhance primary care, which is the part currently missing the most in the Kingdom,” explains Dr Alqahtani.

The importance of patient engagement is reflected in many international guidelines for AF management and treatment. The UK National Institute for Health and Care Excellence (NICE) promotes shared decision-making between healthcare professionals and service users, and recommends a personalised package of care that covers stroke awareness and measures to prevent stroke, rate control, assessment of symptoms for rhythm control and psychological support if needed.<sup>76</sup> The European Society of Cardiology’s guidelines refer to using mobile applications to enhance patient education, improve communication and encourage active patient involvement.

The guidelines also advise physicians to discuss the potential burden of the treatment with the patient and include the patient’s perception of

the treatment burden in the decision-making process.<sup>2</sup> The Canadian Heart Rhythm Society also recommends strategies to improve self-management and patient responsibility.<sup>58</sup>

Although there is limited available information on the policy landscape for AF in Saudi Arabia, the Clinical Practice Guideline on Antithrombotic Treatment of Patients with Non-valvular Atrial Fibrillation, published by the Ministry of Health in 2014, refers to involving patients in treatment decisions. However, the extent of this inclusion in practice is unknown.<sup>77</sup> “In the last two years [the AF centre in Jeddah has built its] own website for atrial fibrillation with educational material in both English and Arabic, spreading patient and community awareness about what the disease is, how to diagnose it and where to reach for help,” says Dr AlShoaibi.

More education and awareness campaigns on the benefits of adherence to guidelines are needed to improve optimal patient outcomes.<sup>39</sup> “General knowledge about AF is low—I don’t think most people [are] aware of it,” says Dr Alghamdi. “Therefore, a public awareness [campaign] for the Kingdom should be something to consider.” Digital and wearable technology innovations are likely to make the public increasingly aware of their health data, prompting self-diagnosis and follow-up.

Global and local patient and scientific organisations, such as AFib.org and the Saudi Heart Rhythm Society, also play a critical role driving public awareness, uniting patients, healthcare providers, industry players and other advocates to support research and innovation in treatment pathways and make sure that the patient’s voice is heard in decision making.

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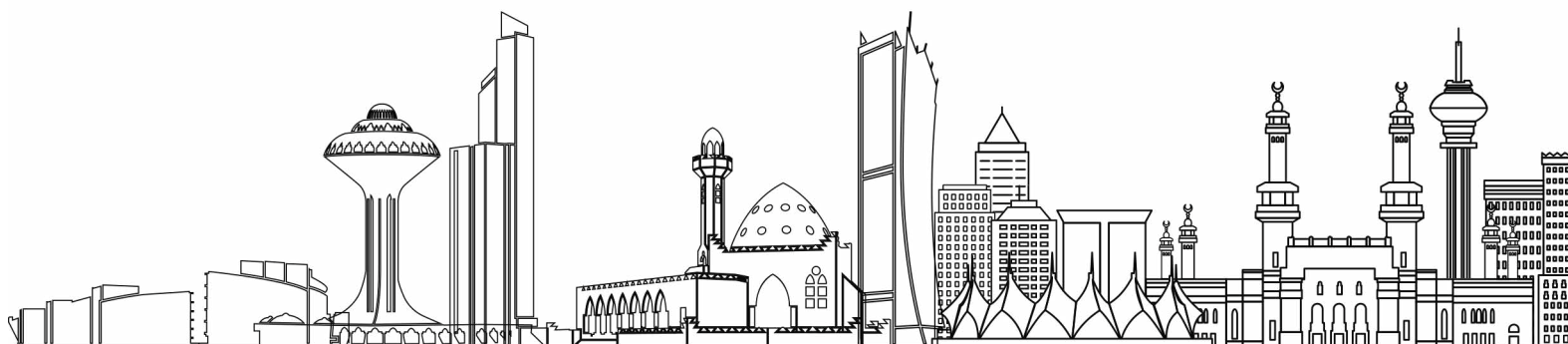
Dr Abdulrahman Alqahtani, executive vice-president of transformation, Health Holding Company

# Conclusion

AF is a major public health problem. This common chronic condition has potentially life-threatening consequences and incurs substantial healthcare expenditure. A growing and ageing population, combined with a high prevalence of chronic disease, will undoubtedly lead to a significant rise in AF cases and broader CVD complications in Saudi Arabia in the coming two to three decades.

Early diagnosis and intervention of AF are crucial to prevent serious complications, improve quality of life, reduce the risk of stroke and other health issues, and ultimately reduce the economic burden of the disease. To effectively diagnose and manage AF cases in Saudi Arabia, a number of pressing challenges need to be addressed, including data availability, fragmented care pathways and awareness levels among medical professionals.

A number of combined policy actions that tackle early detection, education, patient-centric care and technological adoption can contribute to a comprehensive strategy to improve the management of AF in Saudi Arabia. Immediate attention must be paid to improving awareness of AFib among primary care physicians and high-risk individuals and determining appropriate guidelines for AF referral. Other short-term policy initiatives should focus on integrating lifestyle interventions, education and effective management of AF and comorbid conditions into the current model of care. In the longer term, preparing for future healthcare challenges through investing in research and developing infrastructure and legislation to support emerging digital technologies will be vital. In this way, the healthcare system can better serve current and future AF patients, ultimately improving their quality of life and reducing healthcare costs associated with complications.



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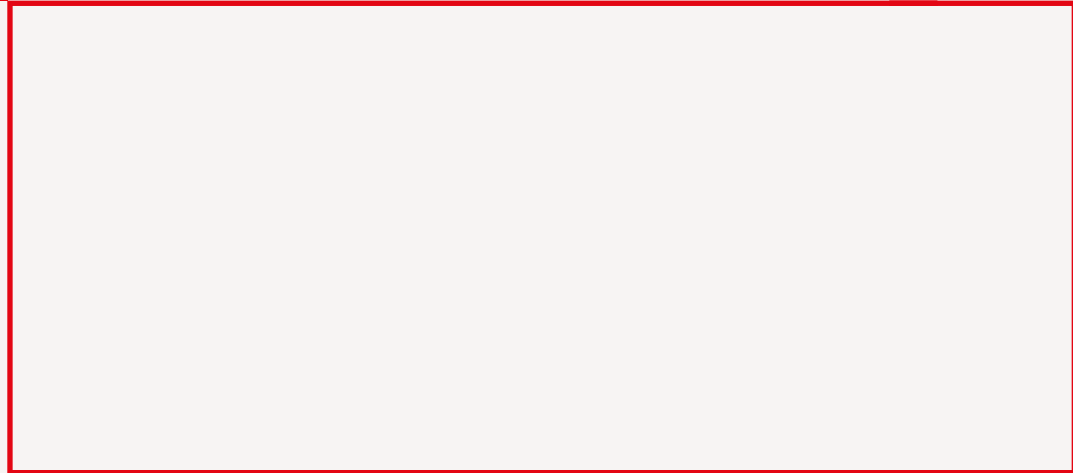
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